CLAIMS

1. A mask pattern correction method, including

a step of creating first position data indicating positions of a plurality of marks when supporting a first thin film having said plurality of marks in a state where a first surface thereof directs upward;

a step of creating second position data indicating positions of said marks when supporting said first thin film in a state where a second surface thereof directs upward;

a step of obtaining a transfer function for converting said first position data to said second position data; and

a step of correcting a mask pattern as a shape of an exposure beam transmission portion to be formed on a second thin film by using an inverse function of said transfer function.

2. A mask pattern correction method as set forth in claim 1, wherein the step of creating said first position data includes

a step of forming marks on said first thin film, and

a step of actually measuring positions of the

marks formed on said first thin film.

3. A mask pattern correction method as set forth in claim 2, wherein the step of forming marks on said first thin film includes

a step of applying a resist on said first thin film,

a step of drawing said marks on said resist by using a charged particle beam, an X-ray, an extremely short wavelength ultraviolet ray or an ultraviolet ray; and

a step of forming holes as the marks by performing etching on said first thin film by using said resist as an etching mask.

4. A mask pattern correction method as set forth in claim 2, wherein the step of forming marks on said first thin film includes

a step of applying a resist on said first thin film, and

a step of drawing said marks on said resist by using a charged particle beam, an X-ray, an extremely short wavelength ultraviolet ray or an ultraviolet ray,

to actually measure positions of marks drawn on said resist.

5. A mask pattern correction method as set forth in claim 2, wherein the step of actually measuring

positions of marks formed on said first thin film includes a step of measuring coordinates of the marks on said first thin film projected on a plane approximately parallel to said first thin film.

6. A mask pattern correction method as set forth in claim 2, wherein the step of actually measuring positions of marks formed on said first thin film includes

a step of measuring coordinates with relatively low positional accuracy, the coordinates being defined when marks on said first thin film are projected on a plane approximately parallel to said first thin film,

a step of measuring heights of marks as positions of said marks in the thickness direction of said first thin film, and

a step of calculating coordinates from said coordinates, said mark heights and said first thin film thickness with relatively high accuracy, the coordinates being defined when the marks on said first thin film are projected on a plane approximately parallel to said thin film.

7. A mask pattern correction method as set forth in claim 2, wherein the step of actually measuring positions of marks formed on said first thin film includes

a step of measuring coordinates with relatively low positional accuracy, the coordinates being defined when marks on said first thin film are projected on a plane approximately parallel to said first thin film,

a step of measuring curvature of said first thin film at respective marks, and

a step of calculating coordinates from said coordinates, said curvature and said first thin film thickness with relatively high accuracy, the coordinates being defined when marks on said first thin film are projected on a plane approximately parallel to said first thin film.

8. A mask pattern correction method as set forth in claim 1, wherein said first position data is created by a simulation.

9. A mask pattern correction method as set forth in claim 8, wherein the finite element method, the boundary element method or the finite difference method is used for said simulation.

10. A mask pattern correction method as set forth in claim 2, wherein the step of creating said second position data includes

a step of supporting said first thin film in a state where the second surface thereof directs upward, and

a step of actually measuring positions of marks formed on said first thin film.

11. A mask pattern correction method as set forth in claim 2, further including

a step of forming second surface side marks on the second surface side of said first thin film;

wherein the step of creating said second position data includes a step of supporting said first thin film in a state where the second surface thereof directs upward, and

a step of actually measuring positions of said second surface side marks.

12. A mask pattern correction method as set forth in claim 2, wherein the step of creating said second position data

includes a step of supporting said first thin film in a state where the second surface thereof directs upward, and making said first surface face to an exposure surface,

a step of irradiating an exposure beam from said second surface side to said first thin film and transferring said marks on said exposure surface by the exposure beam transmitting said marks, and

a step of actually measuring positions of marks transferred to said exposure surface.

13. A mask pattern correction method as set forth in claim 2, wherein the step of creating said second position data includes

a step of applying a resist on a wafer;

a step of supporting said first thin film in a state where the second surface thereof directs upward, and making said first surface face to said resist,

a step of irradiating an exposure beam from said second surface side to said first thin film and performing exposure and development on said resist;

a step of forming marks on said wafer by performing etching on said wafer by using said resist as an etching mask; and

a step of actually measuring positions of marks formed on said wafer.

14. A mask pattern correction method as set forth in claim 1, wherein said second position data is created by a simulation.

15. A mask pattern correction method as set forth in claim 14, wherein the finite element method, the boundary element method or the finite difference method is used for said simulation.

16. A production method of a semiconductor device, including a step of irradiating an exposure beam to an exposure object arranged to face to a first surface of a

mask from the second surface side of said mask and exposing a mask pattern formed on said mask to said exposure object, wherein:

said mask pattern is a pattern corrected by using an inverse function of a predetermined transfer function;

said transfer function is a function for converting first data to second position data;

said first position data indicates positions of a plurality of marks when supporting a transfer function determining thin film having said marks in a state where the first surface thereof directs upward; and

said second position data indicates positions of said marks when supporting said transfer function determining thin film in a state where the second surface thereof directs upward.

17. A production method of a semiconductor device as set forth in claim 16, wherein said mask has holes as exposure beam transmission portions and said holes are formed to be said mask pattern.

18. A production method of a semiconductor device as set forth in claim 16, wherein

said mask comprises an exposure beam transmission film and an exposure beam block film formed on a part of said exposure beam transmission film, and

said exposure beam block film is formed on portions other than said mask pattern.

19. A production method of a semiconductor device as set forth in claim 16, wherein:

said transfer function determining thin film further comprises exposure beam transmission portions formed to be a different mask pattern from that of said mask; and

a step of exposing a mask pattern formed on said transfer function determining thin film on said exposure object is furthermore included.

20. A mask production method, including:

a step of creating first position data indicating positions of a plurality of marks when supporting a first thin film having said marks in a state where a first surface thereof directs upward;

a step of creating second position data indicating positions of said marks when supporting said first thin film in a state where a second surface thereof directs upward;

a step of obtaining a transfer function for converting said first position data to said second position data;

a step of correcting a mask pattern as a shape of exposure beam transmission portions to be formed

on a second thin film by using an inverse function of said transfer function; and

a step of producing a mask including a second thin film having exposure beam transmission portions in a corrected mask pattern.

21. A mask production method as set forth in claim 20, wherein

said second thin film has holes as exposure beam transmission portion, and

said holes are formed in a corrected mask pattern.

22. A mask production method as set forth in claim 20, wherein

said second thin film comprises an exposure beam transmission film and an exposure beam block film formed on a part of said exposure beam transmission film; and

said exposure beam block film is formed on portions other than a corrected mask pattern.

23. A mask production method as set forth in claim 20, including

a step of correcting a mask pattern formed on a third thin film being different from a mask pattern formed on said second thin film by using an inverse function of said transfer function; and

a step of forming exposure beam transmission portions on said third thin film in a corrected mask pattern and producing another mask including said third thin film.

24. A mask production method, including:

a step of creating first position data indicating positions of a plurality of marks when supporting a first thin film having said marks and exposure beam transmission portions in a predetermined pattern in a state where a first surface thereof directs upward;

a step of producing a first mask having said first thin film and a thin film supporting portion formed on a second surface side of said first thin film;

a step of creating second position data indicating positions of said marks when supporting said first thin film in a state where the second surface thereof directs upward;

a step of obtaining a first transfer function for converting said first position data to said second position data;

a step of performing exposure for producing a device by supporting said first thin film in a state where the second surface thereof directs upward and irradiating an exposure beam from the second surface side

to a first mask;

a step of correcting a mask pattern as a shape of exposure beam transmission portions to be formed on a second thin film by using an inverse function of said first transfer function; and

a step of producing a second mask including the second thin film having a plurality of marks and exposure beam transmission portions in a corrected mask pattern.

25. A mask production method as set forth in claim 24, further including:

a step of creating third position data indicating positions of said marks when supporting a second thin film in a state where the first surface thereof directs upward;

a step of creating fourth position data indicating positions of said marks when supporting said second thin film in a state where the second surface thereof directs upward;

a step of obtaining a second transfer function for converting said third position data to said fourth position data;

a step of performing exposure for producing a device by supporting said second thin film in a state where the second surface thereof directs upward and

irradiating an exposure beam from the second surface side to second mask;

a step of correcting a mask pattern as a shape of exposure beam transmission portions to be formed on a third thin film by an inverse function of said second transfer function; and

a step of producing a third mask including a third thin film having a plurality of marks and exposure beam transmission portions in a corrected mask pattern.

26. A mask, having a thin film formed with exposure beam transmission portions in a predetermined pattern, for exposing an exposure beam from a second surface side to an exposure object arranged to face to a first surface of said thin film, wherein:

said pattern is a pattern corrected by using an inverse function of a predetermined transfer function;

said transfer function is a function for converting first position data to second position data;

said first position data indicates positions of a plurality of marks when supporting a transfer function determining thin film having said marks in a state where the first surface thereof directs upward; and

said second position data indicates positions of said marks when supporting said transfer function determining thin film in a state where the second surface

thereof directs upward.